An Evidence-Based Approach To The Evaluation And Treatment Of Pharyngitis In Children

Abstract

Sore throat is a very common complaint, accounting for approximately 7.3 million outpatient physician visits each year among children in the United States. Group A streptococcus (GAS) is the most common bacterial cause of sore throat and is responsible for 15% to 36% of cases.1 Estimated total costs attributable to GAS pharyngitis in children and adolescents are $224 million to $539 million annually, with most of these costs being attributed to parents’ lost work time.2 Pharyngitis is generally a straightforward and self-limited complaint. However, the emergency clinician must appreciate that sore throat can occasionally be a symptom of a much more serious or potentially life-threatening condition.

Case Presentation

It is another busy weekend night in the ED. The next patient waiting to be seen has a chief complaint of “sore throat and fever for 5 days.” You enter the room and find a mother and her 11-year-old son. He is ill-appearing and pale but nontoxic and in no respiratory distress. His mother explains that she took the child to his usual doctor 3 days ago for evaluation of fever, and was told to Monitor and return if symptoms worsened. Today, she brought him to the ED because of the persistence of symptoms.

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and was “negative” per the mother’s report. Results of a throat culture are pending, but since the doctor’s office is closed for the weekend, she does not yet have them. She is very concerned because the child continues to complain of severe sore throat and is running fevers as high as 39°C (102°F). She says, “Doctor, I hope you can help us. I should have insisted that he be prescribed antibiotics while we waited for the throat culture results to come back. He’s just not getting any better!” On examination, you observe enlarged, injected tonsils with a significant amount of white exudate; enlargement of the posterior cervical lymph nodes; and a mildly tender abdomen. You remember the natural history of streptococcal pharyngitis and reply, “I don’t think that an antibiotic would have helped very much in this situation. I recommend doing some laboratory tests to confirm my suspicion.”

**Introduction**

Detection and appropriate treatment of GAS pharyngitis is important to avoid possible serious complications of rheumatic fever, post-streptococcal glomerulonephritis, and peritonsillar abscess. In spite of commonality, there still exists controversy about how to test for GAS pharyngitis, such as the use of rapid antigen detection testing (RADT) and the need for a throat culture. There is somewhat less controversy regarding first-line antibiotic treatment of GAS pharyngitis. New organisms have emerged in recent years that have been found to cause significant sore throat, particularly in adolescents and young adults.

This issue of Pediatric Emergency Medicine Practice focuses on the diagnosis and management of GAS infections and other common causes of pediatric pharyngitis as based on the best available evidence from the literature. After reading this issue, the clinician should be able to differentiate between viral and bacterial pharyngitis, recognize potentially serious or life-threatening causes of pharyngitis, and appropriately diagnose and treat GAS infections.

**Current Practice Guidelines**

Although several guidelines have been published to help the clinician manage pharyngitis in the ambulatory setting, they differ significantly in some respects. Table 1 summarizes current practice guidelines. The American Heart Association/American Academy of Pediatrics (AHA/AAP) guideline is the only one limited to pediatric patients. The other guidelines are adult-centered but include adolescents and patients older than 15 years of age.

A review of Table 1 reveals a number of similarities between the available guidelines. For example, they all recommend that RADT or treatment not be carried out for anyone who has symptoms suggestive of viral illness, such as conjunctivitis, coryza, or cough, regardless of age. With the exception of the Centers for Disease Control and Prevention (CDC)/American Academy of Family Physicians (AAFP)/American College of Physicians (ACP)/American Society of Internal Medicine (ASIM) guideline, all the other organizations listed recommend RADT or throat culture for patients who present with symptoms suggestive of GAS infection. The CDC/AAFP/ACP/ASIM guideline relies on a scoring system to determine whether a patient should undergo RADT or presumptive treatment for GAS. Since the incidence of new-onset rheumatic fever in adults and older adolescents is low, the possibility of missing a case of GAS would not be as serious as in children, because the disease is typically self-limited. The potential also exists to over-treat patients with antibiotics. In fact, this has been shown to be true in adults when physicians followed the CDC guideline. Almost 50% of adults with Centor scores of 3 or 4 who were treated presumptively without RADT did not have GAS pharyngitis and were inappropriately treated with antibiotics. (A more detailed discussion of clinical scoring, as well as use of RADT and throat culture, can be found later in this issue under Diagnostic Studies.)
Critical Appraisal Of The Literature

The literature review included searches of PubMed, the Web of Science, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases and the Cochrane Database of Systemic Reviews for articles published between 1966 and 2011. Search terms included pharyngitis, group A beta-hemolytic streptococcus, rapid antigen detection tests, and throat culture. The results led to further, more detailed searches. The focus of the most current literature includes cost-effectiveness studies and the use of RADT with or without throat culture in the diagnosis of GAS pharyngitis. To date, no RADTs have been tested in clinical trials with a proven sensitivity greater than 90%; thus, the test’s usefulness is limited without the additional information provided by throat culture. These results impact directly on emergency clinicians, as they often have contact with a patient only once and may be unable to reach the family if antibiotic treatment has been withheld while they await the results of a throat culture. Another area of active research is the validation of clinical scoring systems, particularly in developing areas of the world where the rates of acute rheumatic fever are high and microbiology laboratory resources (eg, RADT or throat culture) are lacking. The literature pertaining to adult patients contains spirited debate regarding the presumptive treatment of acute pharyngitis based on clinical findings alone as well as the potential for overprescribing antibiotics, which can lead to the development of antibiotic resistance. However, the vast majority of the pediatric literature reaches a similar conclusion with regard to the diagnosis of GAS pharyngitis and includes recommendations to perform RADT on those children with symptoms that are strongly suggestive of GAS pharyngitis, to provide appropriate treatment for those with positive results on RADT, and to perform back-up throat culture for those with negative RADT results.

Epidemiology, Etiology, And Pathophysiology

As noted previously, several million cases of pharyngitis occur each year in the pediatric age group, accounting for 10% of all visits to healthcare providers. Whether the pharyngitis is of viral or bacterial etiology, most cases are spread via respiratory droplets and aerosol dispersion. School-aged children between the ages of 5 and 15 years are those most often affected. The vast majority of cases of pharyngitis are caused by viruses, which are the primary cause in children under 5 years of age. Group A streptococcus is the most common organism causing bacterial pharyngitis and is the only cause that is treated regularly with antibiotics. A recent meta-analysis found that 37% of children over the age of 5 years and 24% of children under the age of 5 years who presented with symptoms suggestive of GAS pharyngitis tested positive for the disease. Table 2

<table>
<thead>
<tr>
<th>Table 1. Current Practice Guidelines&lt;sup&gt;3-5&lt;/sup&gt;</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization(s)</td>
<td>Age of Population</td>
<td>Viral Symptoms</td>
<td>Symptoms of GAS</td>
<td>Throat Culture If RADT Is Negative</td>
</tr>
<tr>
<td>American Heart Association, endorsed by the American Academy of Pediatrics</td>
<td>Children</td>
<td>No testing or treatment</td>
<td>RADT or throat culture</td>
<td>Yes</td>
</tr>
<tr>
<td>Infectious Diseases Society of America</td>
<td>Children and adolescents</td>
<td>No testing or treatment</td>
<td>RADT or throat culture</td>
<td>Children: yes Adults: no</td>
</tr>
<tr>
<td>Centers for Disease Control, endorsed by the American Academy of Family Physicians, American College of Physicians, and American Society of Internal Medicine</td>
<td>Adolescents and patients older than 15 years of age</td>
<td>No testing or treatment</td>
<td>RADT based on Centor Criteria</td>
<td>No</td>
</tr>
</tbody>
</table>

Centor score = 3 or 4: RADT or treat presumptively

Centor score = 2: RADT or do not test or treat

Centor score = 0 or 1: No testing or treatment

Abbreviations: GAS, Group A streptococcus; RADT, rapid antigen detection test.
shows the common pathogens that cause pharyngitis. Most of these will be discussed in more detail in the Diagnosis And Treatment section, as will other, noninfectious causes of pharyngitis.

## Diagnosis And Treatment

The differential diagnosis of sore throat and pharyngitis in children is broad and includes infectious, inflammatory, traumatic, irritative, allergic, and even psychogenic causes.

It is the goal of the emergency clinician to differentiate between the potentially life-threatening and non–life-threatening causes and then choose the most appropriate work-up and treatment. Airway maintenance is always the first step in treating potentially life-threatening causes of pharyngitis. This might be as simple as allowing the child to choose a position of comfort or as complicated as intubation or achieving a surgical airway via cricothyroidotomy. Intravenous hydration and pain management are useful in almost all cases. Antibiotic therapy is directed at the most likely causative agents.

Treatment of non-life-threatening causes of pharyngitis usually consists of symptomatic relief. Acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs) are useful to reduce fever and discomfort. Salt-water gargles help to debride tonsillar exudates and may offer some pain relief. Some studies have shown that the use of throat lozenges containing topical anesthetics are helpful as well. Oral hydration with cold or warm liquids may be soothing and also prevents dehydration. Steroids have been found to be only somewhat effective in reducing pain associated with pharyngitis in children, with the time to improvement only hours to 1 day; the most significant reduction was seen in patients with known GAS pharyngitis, but it was not found to be significant enough to recommend for routine use. In many studies, patients were often taking antibiotics for GAS pharyngitis and were also allowed to use acetaminophen. In cases of non–life-threatening pharyngitis, steroids are generally reserved for patients with severe tonsillar hypertrophy associated with infectious mononucleosis.

### Potentially Life-Threatening Causes Of Pharyngitis

#### Epiglottitis

Epiglottitis is inflammation of the epiglottis and adjacent supraglottic structures. Without treatment, epiglottitis can progress to life-threatening airway obstruction. After the addition of the *Haemophilus influenzae* type b (HIB) conjugate vaccine to the routine infant immunization schedule in the United States and other developed countries, the epidemiology of epiglottitis changed. Previously, most patients with epiglottitis were toddlers or young children; now, children diagnosed with epiglottitis tend to be older, and the number of cases among adolescents and adults has increased significantly. Currently, the annual incidence of epiglottitis among children immunized against HIB ranges from 0.60 to 0.78 cases per 100,000. The classic symptoms of epiglottitis include sore throat and fever, with rapid deterioration characterized by difficulty breathing, stridor, and a muffled voice (which, if unrecognized, may lead to airway obstruction and respiratory failure). As compared with its course in younger children, the disease in adolescents has been observed to progress more slowly, often developing over days rather than hours.

In the age of widespread immunization against HIB, the most common organisms causing epiglottitis are *S pneumoniae, Staphylococcus aureus*, beta-hemolytic streptococci, and nontypeable H influenzae. Third-generation cephalosporins, such as

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### Table 2. Common Pathogens Causing Acute Pharyngitis

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Symptoms or Disease</th>
</tr>
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<tbody>
<tr>
<td><strong>Viruses</strong></td>
<td></td>
</tr>
<tr>
<td>Adenovirus</td>
<td>Upper respiratory symptoms, conjunctivitis</td>
</tr>
<tr>
<td>Coronavirus</td>
<td>Upper respiratory symptoms</td>
</tr>
<tr>
<td>Rhinovirus</td>
<td>Upper respiratory symptoms</td>
</tr>
<tr>
<td>Enteroviruses (Coxsackie)</td>
<td>Gingivostomatitis, hand-foot-mouth disease</td>
</tr>
<tr>
<td>Herpes virus</td>
<td>Gingivostomatitis</td>
</tr>
<tr>
<td>Influenza A or B virus</td>
<td>Influenza</td>
</tr>
<tr>
<td>Parainfluenza virus</td>
<td>Upper respiratory symptoms, hoarseness, stridor, croup</td>
</tr>
<tr>
<td>Epstein-Barr virus</td>
<td>Mononucleosis</td>
</tr>
<tr>
<td>Cytomegalovirus</td>
<td>Mononucleosis-like illness</td>
</tr>
<tr>
<td>Human immunodeficiency virus</td>
<td>Mononucleosis-like illness, adenopathy, weight loss</td>
</tr>
<tr>
<td>virus (HIV)</td>
<td></td>
</tr>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
</tr>
<tr>
<td>Group A streptococcus</td>
<td>Strep throat, scarlet fever</td>
</tr>
<tr>
<td>Non–group A streptococcus (primarily groups C and G)</td>
<td>Pharyngitis</td>
</tr>
<tr>
<td><em>Fusobacterium necrophorum</em></td>
<td>Lemierre syndrome, septic thrombophlebitis of the internal jugular vein and septic emboli</td>
</tr>
<tr>
<td><em>Neisseria gonorrhoeae</em></td>
<td>Pharyngitis</td>
</tr>
<tr>
<td><em>Chlamydia pneumoniae</em></td>
<td>Respiratory illness</td>
</tr>
<tr>
<td><em>Mycoplasma pneumoniae</em></td>
<td>Respiratory illness, pharyngitis, headache</td>
</tr>
<tr>
<td><em>Arcanobacterium haemolyticum</em></td>
<td>Pharyngitis and scarlatiniform rash</td>
</tr>
<tr>
<td><em>Corynebacterium diphtheriae</em></td>
<td>Diphtheria, thick gray membranous exudates</td>
</tr>
<tr>
<td><em>Francisella tularensis</em></td>
<td>Tularemia, ulcerative pharyngitis</td>
</tr>
</tbody>
</table>
Peritonsillar infection may compromise the submandibular lymphadenopathy may be present on examination of the uvula to the opposite side. Cervical and upper airway or spread to the surrounding structures, including the masseter and pterygoid muscles and the carotid sheath, leading to potentially fatal complications of septicemia or carotid artery rupture.

Surgical interventions for peritonsillar abscess include needle aspiration, incision and drainage, and tonsillectomy. Many patients will improve with needle aspiration and antibiotic therapy. Infections are usually polymicrobial and include a combination of anaerobic and aerobic organisms. Clindamycin and cephalosporins are the most commonly used antibiotics.

Lemierre Syndrome
In Lemierre syndrome, acute pharyngitis progresses to a more serious infection that spreads to the parapharyngeal space, leading to septic thrombophlebitis of the internal jugular vein. It is usually caused by *Fusobacterium necrophorum*, an anaerobic organism. More commonly seen in adolescents and adults, it presents as continued sore throat and fever that progresses to persistent fever and unilateral neck pain with stiffness and swelling. If unrecognized, the condition can lead to septic emboli, primarily to the lungs, but hepatic, renal, and joint involvement are possible. It is important to maintain a high index of suspicion, since without treatment the mortality rate can be as high as 50%.

Many organs can be affected due to septic emboli released from the infected thrombus in the internal jugular vein. Patients frequently show signs of sepsis and often need to be managed in an intensive care unit. Antibiotic therapy is targeted at *Fusobacterium spp.*, gram-negative anaerobes that cause up to 90% of infections. Clindamycin and metronidazole are most frequently used. Surgical drainage of a neck abscess, septic joint, or empyema may be necessary. Anticoagulation therapy has not been proved to be of benefit in controlled studies but may be used on a case-by-case basis.

Diphtheria
Since the initiation of widespread vaccination programs, diphtheria occurs only rarely in the United States. According to a 2010 global summary from the World Health Organization, the last known case in the United States was reported in 2003. However, in the early 1990s, there was a widespread outbreak of the disease in Russia and in countries of the former Soviet Union. The disease is more common among persons who have not been immunized and the socially disadvantaged. *Corynebacterium diphtheriae* is an exotoxin-producing gram-positive rod. Spread by respiratory droplets, this organism can cause severe pharyngitis, significant cervical adenopathy (“bull neck”), and the formation of a tenaciously adherent gray pseudomembrane in the pharynx, nasopharynx, or trachea. Death may re-
sult from respiratory obstruction or toxin-mediated sepsis and circulatory collapse.\textsuperscript{11}

**Non–Life-Threatening Causes Of Pharyngitis**

**Bacterial Pharyngitis**

**Group A Streptococcus**

Group A streptococcus is the most common bacterial cause of pharyngitis in children, accounting for 15\% to 36\% of cases.\textsuperscript{1} As mentioned previously, children between the ages of 5 and 15 years are most commonly affected, with most cases presenting in the winter and spring. Typical symptoms include fever and sore throat of acute onset. Younger children often complain of generalized abdominal pain. The tonsils are enlarged and injected. Tonsillar exudates are usually present and can be thick or thin and of several colors, including white and gray. The anterior cervical lymph nodes are swollen and tender to palpation. Palatal petechiae may be evident. Scarlet fever is caused by erythrogenic strains of GAS that lead to a characteristic erythematous, sandpaper-like rash and sometimes a white or red “strawberry tongue.” Children under 5 years of age usually present with atypical symptoms, including prolonged nasal drainage, excoriated nares, and tender, swollen cervical lymph nodes.\textsuperscript{11}

The risk of GAS infection in all age groups increases if there is a school-aged contact with GAS in the home. Without treatment, the illness is self-limited and will generally resolve on its own within 5 days. The primary rationale for treating GAS with antibiotics is to prevent suppurrative complications, such as peritonsillar abscess, as well as immune-mediated complications or nonsuppurative complications, such as rheumatic fever and poststreptococcal glomerulonephritis. Rheumatic fever is quite rare in the United States, although it is still a leading cause of acquired heart disease in the developing world.

Group A streptococcus is the only bacterial cause of pharyngitis that is regularly treated with antibiotics. (See Table 3.) Treatment hastens symptom relief, decreases contagiousness, and prevents suppurrative and nonsuppurative complications.\textsuperscript{38} When one is choosing an antibiotic to treat GAS pharyngitis, several factors must be kept in mind, including efficacy, ease of administration and palatability (particularly for children), cost, patient allergy, and local GAS susceptibilities. Oral penicillin V administered 2 to 3 times a day remains the first choice for treating GAS pharyngitis. A single intramuscular dose of penicillin G may be given if patient adherence is an issue, if the patient is vomiting and unable to tolerate oral intake, or in low-resource settings where patients may not have access to the prescribed medication. There has never been a documented case of GAS resistance to penicillin, and it has a very narrow spectrum of activity and is inexpensive.\textsuperscript{3} A recent Cochrane review cites these reasons and found that there is no strong evidence to recommend anything but penicillin as first-line treatment for GAS pharyngitis.\textsuperscript{39} The recommended course of treatment with penicillin is 10 days; however, another recent Cochrane review found that in areas where the incidence of acute rheumatic fever is low, 3- to 6-day courses of penicillin are just as effective.\textsuperscript{40} The reportedly higher number of “treatment failures” after a course of penicillin V versus a first-generation cephalosporin is thought to be more likely the result of GAS carriage in the pharynx than of true infection.\textsuperscript{41}

The disadvantage of penicillin in treating children with GAS is its unpleasant taste, which can make it difficult to administer and lead to decreased adherence. Amoxicillin has been shown to be an adequate substitute and is far more palatable. An additional benefit is that amoxicillin given once a day has been shown in several studies to be as effective as twice-daily penicillin V.\textsuperscript{42,43} For penicillin-allergic patients, the Infectious Diseases Society of America and the CDC/AAFP/ACP/ASIM guideline recommends erythromycin, a first-generation cephalosporin (cephalexin or cefadroxil), or, in the rare case of an erythromycin-resistant strain of GAS in a patient who is also allergic to penicillin, clindamycin.\textsuperscript{4,5}

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dose</th>
<th>Duration</th>
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| Penicillin V                     | Children $\leq$ 27 kg: 250 mg PO 2 or 3 times a day  
Children $>$ 27 kg and adolescents: 500 mg PO 2 or 3 times a day | 10 days  |
| Amoxicillin                      | 50 mg/kg/day PO daily (maximum 1 g/day)    | 10 days  |
| Benzathine/penicillin G          | Children $\leq$ 27 kg: 600,000 units IM  
Children $>$ 27 kg: 1,200,000 units IM | One time only |
| First-generation cephalosporin   | Dose varies depending on agent chosen     | 10 days  |
| (cephalexin or cefadroxil)       |                                           |          |
| Azithromycin                     | 12 mg/kg PO daily (maximum 500 mg/day)    | 5 days   |
| Clindamycin                      | 20 mg/kg/day PO divided into 3 doses (maximum 1.8 g/day) | 10 days  |

Abbreviations: IM, intramuscularly; PO, by mouth.
The most current AHA/AAP guideline no longer lists erythromycin on the list of preferred antibiotics to treat GAS, although this drug is discussed in the body of the guideline. Erythromycin is typically given 4 times a day and is commonly associated with diarrhea and other gastrointestinal upset, making it an unattractive treatment option. Other macrolides, such as azithromycin and clarithromycin, may be used instead of erythromycin. The first-generation cephalosporins (eg, cephalaxin and cefadroxil) are also excellent choices, as long as there is no history of immediate or type 1 hypersensitivity reactions to penicillins because of the small chance of cross-reactivity.

Children who chronically and asymptptomatically carry GAS in the pharynx generally do not need to be treated other than in the rare instance when a close contact has a history of rheumatic fever or rheumatic heart disease, they live in a closed community or institution, or there is a community outbreak of rheumatic fever. Treatment includes clindamycin or benzathine penicillin G/amoxicillin/cephalosporin plus rifampin. There are no specific recommendations for empirically treating children for GAS without first performing RADT or obtaining a BAP throat culture. However, a recent review noted that, in some specific situations, there is “sufficient clinical and epidemiological evidence that antimicrobial therapy can be initiated while awaiting laboratory confirmation, provided that such therapy is discontinued if the diagnosis of GAS is not confirmed by a laboratory test.” These include the presence of a scarlatiniform rash, a current diagnosis of rheumatic fever, or a past history of rheumatic fever.

Groups C And G Streptococcus
Infection with these strains of streptococcus can cause pharyngitis with symptoms similar to those caused by GAS but usually less severe in nature. There have been well-documented outbreaks of food-borne pharyngitis caused by both groups. Group C is a relatively common cause of pharyngitis among college students. Since neither strain is known to cause rheumatic fever, it is generally acceptable to offer symptomatic treatment because, as with GAS infection, the course is usually self-limited. Antibiotic treatment may be offered to patients with more severe disease or to those who do not respond to symptomatic treatment alone.

Arcanobacterium haemolyticum
Infection with this organism can cause symptoms indistinguishable from those caused by GAS and can result in a scarlatiniform rash. It is uncommon and appears to have a higher incidence among adolescents. A haemolyticum is a slow-growing organism on the sheep’s blood agar plates (BAPs) used for throat culture in most facilities and is therefore often not identified. Infection with A haemolyticum should be suspected in an adolescent with pharyngitis and a scarlatiniform rash with a negative RADT and throat culture. Treatment with erythromycin is preferred owing to reports of penicillin failure.

Neisseria gonorrhoeae
Pharyngitis caused by N gonorrhoeae is relatively uncommon, with symptoms and findings on physical examination similar to those seen in GAS pharyngitis, including tonsillar exudates, pain on swallowing, and tender anterior cervical lymphadenopathy. It is more common in sexually active adolescents who engage in fellatio and is a possible sign of sexual abuse if diagnosed in a child. If infection with N gonorrhoeae is suspected, throat swab specimens must be incubated on Thayer-Martin medium. The preferred treatment is a single dose of intramuscular ceftriaxone.

Mycoplasma pneumoniae And Chlamydia pneumoniae
M pneumoniae is a common cause of respiratory illness and pneumonia in school-aged children. Pharyngitis and headache are two of the most common complaints of patients with this infection. The presence of a cough is a clinical clue that the symptoms are not due to GAS. C pneumoniae infections are clinically indistinguishable from those caused by M pneumoniae and have been seen in children in all age groups. The preferred treatment of either infection is azithromycin.

Francisella tularensis
Pharyngitis is one of several clinical syndromes that can be associated with F tularensis infection. Infection usually results from eating under-cooked wild game or drinking contaminated water. The tonsillar exudates seen on examination may mimic the pseudomembrane seen in diphtheria. A high index of suspicion must be maintained in endemic areas, since the organism will not grow on the usual throat culture media. Treatment is with gentamycin.

Viral Pharyngitis
Rhinovirus And Coronavirus
Both these viruses are causes of the common cold. Although pharyngitis is often a symptom of infection, coryza and cough are also prominent features, which should indicate to the clinician that the patient’s sore throat is probably not due to GAS infection. Symptomatic treatment and adequate oral hydration are typically all that are required for these self-limited infections.

Adenovirus
The most common presentation of adenovirus infection includes pharyngitis, coryza, and fever. Pharyng-
goconjunctival fever is a clinically distinct syndrome caused by a specific serotype of adenovirus that is characterized by high fever (>39°C [102.2°F]), pharyngitis with or without tonsillar exudates, nonpurulent conjunctivitis, rhinitis, and preauricular and cervical adenopathy. Adenoviral infections can mimic serious bacterial infections with high fevers, leukocytosis, elevated erythrocyte sedimentation rate, and elevated C-reactive protein levels. Most infections require only symptomatic treatment.

**Parainfluenza**
Parainfluenza infections cause a variety of upper and lower respiratory illnesses. Common upper respiratory infections include croup and laryngotracheitis. Pharyngitis is usually accompanied by a hoarse voice, inspiratory stridor, and a barking cough. Respiratory distress or failure may be seen in severe infections owing to edema of the upper airway. Severe illness may also mimic life-threatening bacterial infections such as epiglottitis or bacterial tracheitis. Mild to moderate illness can usually be managed with humidified air, oral or intramuscular steroid, aerosolized epinephrine, and adequate hydration.

**Influenza A And B**
Pharyngitis is one of many symptoms associated with influenza infection. Fever, cough, coryza, myalgia, headache, and vomiting are commonly associated with influenza. Symptomatic care is the mainstay of treatment, along with the use of an antiviral medication such as oseltamivir.

**Coxsackie Virus**
A member of the enterovirus genus, coxsackie virus is a common cause of febrile illness in the summer and fall. Hand-foot-mouth disease is caused primarily by coxsackie virus A16, which manifests as pharyngitis and vesicular lesions of the soft palate and posterior pharynx as well as a vesicular rash primarily on the hands and feet that may also be seen on the buttocks. Treatment is supportive, with attempts to avoid the common complication of dehydration by minimizing mouth pain.

**Herpes Virus**
The most common manifestation of primary herpes simplex virus type 1 (HSV-1) infection is gingivostomatitis, along with exudative or nonexudative pharyngitis, vesicular oral lesions in all areas of the mouth (including the lips), gingival inflammation, bleeding and edema, cervical adenopathy, and high fever. As in coxsackie virus infection, dehydration is the primary complication owing to decreased oral intake. A 1993 study found that herpes simplex virus caused pharyngitis in 5.7% of 613 college students who presented to a student health clinic with sore throat. More than half the subjects did not have oral lesions. In a randomized double-blind placebo-controlled study, oral acyclovir begun within the first 3 days of illness was shown to shorten the duration of illness.

**Human Immunodeficiency Virus**
Primary infection with human immunodeficiency virus (HIV) is often marked by the “acute retroviral syndrome,” which occurs within days to weeks after the primary infection and is characterized by complaints of high fever of acute onset, nonexudative pharyngitis, lymphadenopathy, malaise, rash, and diarrhea. In patients at high risk, HIV infection must be included in the differential diagnosis of pharyngitis that is accompanied by other “mono-like” symptoms, along with other illnesses that cause similar symptoms (including Epstein-Barr virus, cytomegalovirus, human herpes virus 6, hepatitis A, and *Toxoplasma gondii* infections).

**Infectious Mononucleosis**
Most commonly associated with Epstein-Barr virus, infectious mononucleosis is a common infection, particularly in teens and young adults, although it is frequently diagnosed in younger children as well. It should be considered in patients who have fever and symptoms that last longer than those of a typical GAS infection. Classically, there is fever of slow onset (over days) (39°C-40°C [102.2°F-104°F]), severe sore throat, and cervical lymphadenopathy (anterior or posterior). In young children, peri-orbital edema is more frequently seen. Teens and young adults more often complain of extreme fatigue and malaise. Hepatomegaly and splenomegaly are possible findings. The pharyngitis associated with mononucleosis is often exudative and can be accompanied by significant edema of the tonsils, potentially leading to airway obstruction. The finding of exudative pharyngitis and fever may lead the clinician to suspect and clinically diagnose GAS pharyngitis. Although it has been reported that up to 30% of patients may have co-infection with GAS, a positive result on RADT may also indicate coincidental carriage of the organism. Treatment with amoxicillin or ampicillin can lead to a pruritic, erythematous, morbilliform rash covering approximately 95% of the body, which can be distressing to the patient and their family. Diagnosis is usually made based on clinical features and laboratory studies, including a complete blood count (CBC) with differential, heterophile antibody screen, or “monospot” test or on specific testing for antibodies against Epstein-Barr virus. Liver enzymes may also show modest elevations. The CBC usually reveals lymphocytosis (greater than 50%) and atypical lymphocytes. In one study, the finding of more than 10% atypical lymphocytes on a peripheral smear had a sensitivity of 75% and a specificity of 92% for a diagnosis of mononucleosis. Mild
thrombocytopenia is also a common finding. Het-erophile antibody rapid tests for mononucleosis are often negative in the first week of illness and have been found to be much less sensitive in children under 12 years of age.66 In cases of severe illness or illness in a young child, it is appropriate to test for Epstein-Barr virus–specific antibodies to confirm the diagnosis. The illness is usually self-limited and lasts for 2 to 3 weeks. Treatment of infectious mononucleosis includes rest, adequate hydration and antipyretics and anti-inflammatory medications for pain (acetaminophen or ibuprofen). Some clinicians have advocated the use of steroids for symptom control, but a recent Cochrane review found insufficient evidence to recommend this.67 Steroid treatment should be reserved for patients with severe tonsillar hypertrophy with signs of impending upper airway obstruction.

Noninfectious Causes Of Pharyngitis
In addition to infectious causes of pharyngitis, there are a number of noninfectious etiologies to keep in mind.

Kawasaki Disease
Also known as mucocutaneous lymph node syn-drome, Kawasaki disease is a self-limited acute vasculitis of unknown etiology that affects primarily infants and young children. It is mentioned in the differential diagnosis of pharyngitis, since patients with Kawasaki disease may have signs and symptoms that overlap with those of other more common causes of pharyngitis, such as fever, sore throat, pharyngeal injection, strawberry tongue, rash, and cervical lymphadenopathy. Patients with this disease will often have other findings that help the clinician differentiate Kawasaki disease from other causes of pharyngitis, such as a protracted fever (5 days or more); red eyes without discharge; dry, cracked, red lips; and swelling and redness of the hands or feet. The primary reason to diagnose and treat Kawasaki disease is to avoid the formation of coronary artery aneurysms. All patients diagnosed with this disease should have an echocardiogram to screen for the presence of coronary artery aneurysms.68 Treatment consists of intravenous immune globulin (IVIG) and high-dose aspirin.

Thrush
A common condition in newborns and infants, the fungal infection known as thrush can present with decreased appetite or refusal to eat, leading a caretaker to believe that the child has a sore throat. Examination of the mouth and pharynx reveals tenacious white plaques on the tongue, buccal mucosa, hard and soft palates, and perhaps the posterior pharynx, with surrounding erythema.69 Candidal diaper dermatitis may be present as well.

The diagnosis of thrush in an older child is less common and should suggest possible immune deficiency or HIV infection.69

Allergic Rhinitis
In addition to complaining of a sore throat that is often described as “dry” or “scratchy,” patients with allergic rhinitis will often have rhinorrhea, cough, and itchy, watery eyes. Fever is not associated with allergic rhinitis.

Foreign-Body Aspiration Or Ingestion
Ingestion or aspiration of small objects, such as fish bones, may not be apparent after an initial choking episode. Sharp objects may become embedded in the soft tissue of the posterior pharynx and lead to symptoms of sore throat, cough, hoarseness, or difficulty breathing. Foreign bodies may puncture the posterior pharynx or soft palate, leading to serious infections and possible injury to surrounding deep neck structures.26 Removal of visible foreign bodies from a child’s pharynx is generally best left to a subspecialist in a controlled environment.

Inhalation Exposure
Exposure to noxious fumes or smoke may lead to pharyngeal irritation and sore throat. It is often accompanied by cough and eye irritation.

Gastroesophageal Reflux Disease
Persistent or intermittent reflux of acidic gastric contents may lead to pharyngitis that is often accompanied by cough and chest discomfort. Pain is most frequently present after meals and when the person is in the supine position.

Psychogenic Pharyngitis
After a choking spell, patients may complain of dysphagia, sore throat, or a persistent foreign-body sensation, referred to as globus.

Prehospital Care
For the majority of patients with pharyngitis who present to the ED, prehospital care is limited to prior efforts at home to reduce fever and pain. However, in those cases of pharyngitis due to potentially life-threatening causes, such as epiglottitis, following the standard Basic Life Support/Pediatric Advanced Life Support (BLS/PALS) protocol — maintenance of airway patency, breathing, and circulation — is paramount. Patients with significant respiratory distress, air hunger, anxiety, stridor, drooling, or dysphonia should be allowed to maintain a position of comfort, preferably on the parent’s lap for young children, with a minimum of manipulation, since crying can acutely worsen symptoms and lead to total airway obstruction. Supplemental oxygen should be deliv-
quired in the least irritating manner possible, such as a blow-by or parent-held mask. For children who are in frank respiratory failure, oxygenation via bag-valve-mask should be initiated immediately. High pressures may be necessary if the airway is obstructed. Since significant airway edema may be present, intubation may be technically challenging and is best done in a controlled environment with support from an otolaryngologist or anesthetist. Peripheral placement of an intravenous (IV) line is recommended if the child has signs and symptoms of dehydration but should be avoided if the child is in significant respiratory distress and would become too upset.

**Emergency Department Evaluation**

The primary goal of the emergency department (ED) evaluation is to determine whether the patient has a life-threatening or non-life-threatening cause of pharyngitis. A thorough history and physical examination are the keys to making this determination. Keeping in mind the epidemiology and seasonality of certain diseases will also assist in making the proper diagnosis. For example, GAS infections are most common in children 5 to 15 years of age and are more common in the winter and spring. Mononucleosis is more common in adolescents and young adults. Coxsackie virus infection is typically seen in younger children in the summer and fall.

**Important Questions On History**

*How long have the symptoms been present?* In the majority of cases, sore throat of viral or bacterial cause is self-limited, with a course of 3 to 5 days. Sore throat that persists beyond 5 days warrants further investigation and should prompt the clinician to broaden the differential diagnosis.

*Was the onset acute, or has there been a gradual worsening of pain?* Again, most cases of sore throat caused by viruses or bacteria present acutely, whereas a sore throat that has progressively worsened over time is more likely due to a more serious condition, such as a peritonsillar abscess, retropharyngeal abscess, or Lemierre syndrome.

*Where is the pain?* Localizing the pain can be useful. Older children and adolescents should be able to describe the pain as unilateral or more generalized and indicate which area hurts the most. Unilateral throat pain suggests peritonsillar abscess, a retained foreign body, or cervical adenitis.

*Was there a preceding choking spell or exposure to smoke or other chemical?* This information can be very helpful in either aiding in the diagnosis or guiding the work-up.

*Are there ill contacts with similar symptoms?* School-aged contacts with GAS pharyngitis can spread the illness to their younger siblings, even infants and toddlers. Children at camp or college students living in dormitories can be sources of infection with enterovirus, infectious mononucleosis, and non-GAS pharyngitis.

**Is there a significant past medical history?** Gastroesophageal reflux disease (GERD), allergic rhinitis, chronic sinusitis, snoring, or sleep apnea may all lead to symptoms of pharyngitis. Of note, these conditions are not usually associated with actual painful swallowing (odynophagia) and usually are not constantly present throughout the day. Patients with GERD will have more symptoms after eating a meal, whereas those with allergic rhinitis will have more discomfort in the morning owing to mouth-breathing during sleep. Although rheumatic fever or rheumatic heart disease is quite rare in the developed world, it is important to ask whether the patient has such a history.

**Is there a significant past surgical history?** Recent dental work, such as root canal surgery or oral piercing, increases the risk of oropharyngeal infection.

**Is the patient sexually active?** It is critical to directly question adolescents about any sexual activity, since sexual activity increases the risk of pharyngitis due to *N gonorrhoeae*, herpes virus, or HIV infection and can assist in guiding the work-up if more common etiologies of pharyngitis are not found.

**What treatment was administered prior to arrival in the ED?** Assessing the patient’s home treatment will assist in formulating a care plan upon discharge. If acetaminophen or ibuprofen has not been effective in treating the patient’s pain at home, a stronger analgesic may be required. It is also important to ask whether the patient has taken an antibiotic prior to arrival. Often people will save pills left over from old, unfinished prescriptions. Most GAS-positive throat cultures will clear within 24 hours of the start of antibiotic therapy, possibly altering the choice of further tests.

**What other associated symptoms are present?** Fever, respiratory symptoms, changes in the voice, and other complaints may also signal pharyngitis in the pediatric patient.

**Fever**

Fever is a hallmark of an infectious or inflammatory process and is often present in a variety of viral and bacterial conditions. The height of the fever, although not specific to any particular disease, can sometimes be helpful for guiding the work-up, particularly in older children and adolescents who typically do not mount as vigorous a febrile immune response to infection as do toddlers and younger children. Fever, of greater than 39°C (102.2°F) in an older child or adolescent should prompt the clinician to consider bacterial causes of pharyngitis such as peritonsillar abscess, Lemierre syndrome, or a GAS infection. Fevers greater than 40°C (104°F) in younger children may indi-
cates a bacterial infection and sepsis, prompting the consideration of retropharyngeal abscess or epiglottitis, depending on what other symptoms are present. Keep in mind that viral infections can lead to high fevers as well, particularly those due to influenza, coxsackie virus, Epstein-Barr virus, and herpes virus. The duration of a fever is also an important consideration, since a fever persisting longer than 4 to 5 days should prompt further investigation into other causes of pharyngitis beyond viral or GAS, such as infectious mononucleosis, Kawasaki disease, or cervical adenitis.

Respiratory Symptoms
Respiratory symptoms can range from nasal congestion and cough to acute respiratory distress. At the less severe end of the spectrum, nasal congestion and cough may be due to viral or M pneumoniae infection or allergic rhinitis. Respiratory distress marked by stridor, increased work of breathing, cyanosis, or refusal to recline should immediately suggest potentially life-threatening causes of pharyngitis such as epiglottitis, retropharyngeal abscess, parapharyngeal abscess, severe cough, or extreme tonsillar hypertrophy due to infectious mononucleosis.

Voice Changes
Voice changes are associated with different causes of pharyngitis. Hoarseness can be seen with viral croup or laryngitis due to inflammation of the glottis and vocal cords. A muffled or “hot potato” voice is frequently observed in patients with peritonsillar abscess or with significant tonsillar hypertrophy due to infectious mononucleosis or GAS infection.

Other Complaints
Headache, generalized abdominal pain, nausea, and vomiting are often associated with GAS infections, particularly in younger children. Headache and diarrhea are often complaints with adenovirus and coxsackie virus infections. Eye redness and drainage is also seen with adenovirus or other viral illnesses, and redness without drainage is observed in Kawasaki disease. Rash can be associated with many causes of pharyngitis, including GAS, coxsackie virus, Epstein-Barr virus, and A haemolyticum infections.

Physical Examination
General Appearance
The patient’s appearance is the most immediate and often the most telling aspect of the physical examination. Before a hand is laid on the patient, a rapid general assessment will alert the clinician as to how ill the patient is. If the patient is sitting quietly on the parent’s lap and smiling, the chances of there being a life-threatening cause of pharyngitis is much lower than if the patient appears anxious and air hungry, is drooling, and refuses to lie down. In such situations, stabilization and preparation for resuscitation may occur simultaneously with taking the history and performing a focused physical examination.

Vital Signs
Review of the vital signs is essential and can also reveal much about the patient’s condition before the actual examination. Fever indicates a likely infectious cause of pharyngitis. An elevated pulse may be due to fever or pain or may indicate that the patient is compensating for dehydration. Elevated blood pressure may be due to anxiety or pain; a low blood pressure suggests severe dehydration or sepsis. The respiratory rate may be increased because of fever, infection (eg, pneumonia), or partial airway obstruction. Decreased oxygen saturation suggests lung disease, sepsis, or impending respiratory failure.

Eyes
Frequently, a febrile patient will have hyperemic conjunctivae owing to peripheral blood vessel dilatation. Injected conjunctivae with purulent or mucoid drainage indicate a likely viral cause of pharyngitis. Edema of the eyelids without conjunctival injection or drainage can be seen in infectious mononucleosis, particularly in younger children. Injected conjunctivae with sparing of the limbus and no drainage in the setting of fever present for more than 5 days suggest Kawasaki disease.

Nose
Clear, mucoid, or purulent rhinorrhea is seen with viral illness or acute sinusitis. Pale, edematous turbinates with rhinorrhea suggest allergic rhinitis.

Mouth And Throat
Drooling
Drooling, often the result of severe pain on swallowing or obstruction of the throat due to enlarged tonsils or another type of obstruction, is usually an ominous sign. Patients who are drooling are usually significantly dehydrated and require careful monitoring.

Edema
Edema can be present as a generalized swelling of the posterior pharynx or tonsils in pharyngitis caused by a viral or bacterial infection. Of greater concern is the finding of unilateral tonsillar or soft palate edema, which is a common finding in peritonsillar abscess or cellulitis. The uvula may be edematous in cases of uvulitis, usually caused by nontypeable H influenza, or may be deviated toward the unaffected side in a patient with peritonsillar abscess. Elevation of the tongue or firm swelling on the floor of the mouth, particularly in the setting of recent dental work, suggests Ludwig angina, an anaerobic infection of the mouth and neck. Edema of the tongue and lips in addition to pharyngeal edema should raise concern about a possible anaphylactic allergic reaction.
Clinical Pathway For Evaluation Of Potentially Life-Threatening Causes Of Pharyngitis

Assess airway and respiratory status

Is there evidence of airway obstruction?

YES → Perform PALS resuscitation. Consider specialty consultation if difficult airway is anticipated. (Class I)

NO → Is there evidence of dehydration?

YES → Insert a peripheral IV if patient is not in danger of acute airway obstruction. (Class II)

NO → Is drooling, stridor, or fever present?

YES → Consider epiglottitis. Maintain patient’s position of comfort. Arrange an ENT consultation to directly inspect epiglottis in OR. (Class I)

NO → Is neck pain, decreased ROM, or fever present?

YES → Consider retropharyngeal abscess. Order lateral neck x-ray or CT with contrast. Utilize IV hydration and antibiotics. (Class I)

NO → Are any of the following present?

Muffled voice
Unilateral neck pain
Unilateral tonsillar enlargement
Uvular deviation

YES → Consider peritonsillar abscess. Utilize IV hydration and needle aspiration. (Class II) Utilize IV or oral antibiotics and order ENT consultation for Possible I&D (Class I)

NO → Is the patient feverish, toxic-appearing, suffering from unilateral neck pain, or adolescent?

YES → Consider Lemierre syndrome. Utilize IV antibiotics and hydration. Order CT of the neck with contrast to evaluate for jugular venous thrombus. (Class I)

NO → Does the patient have tonsillar exudates, swollen tonsils, or difficulty breathing when supine?

YES → Consider mononucleosis with upper airway obstruction. Order IV hydration, with dexamethasone 0.3 mg/kg IV and mononucleosis spot test. (Class II)

NO →

Abbreviations: CT, computed tomography; ENT, ear, nose, throat; I&D, incision and drainage; IV, intravenous; OR, operating room; PALS, pediatric advanced life support; ROM, range of motion.

For class of evidence definitions, see page 26.
Clinical Pathway For Evaluation Of The Child With Pharyngitis

Assess airway and respiratory status

Is there evidence of airway obstruction?

Is there evidence of dehydration?

Perform history and physical examination

Are upper respiratory infection symptoms present?

All modified Centor criteria met?

Some modified Centor criteria met?

Consider alternate diagnosis.

Perform PALS resuscitation. Consider specialty consultation if difficult airway is anticipated.

Order adequate analgesia with peripheral or oral hydration.

Do not perform RADT or throat culture. Do not treat with antibiotics. Practice symptomatic care.

Perform RADT

Is RADT positive?

Perform throat culture. Obtain contact information.

Treat with appropriate antibiotic.

Perform RADT or throat culture alone.

Is RADT or culture positive?

Consider alternate diagnosis.

Treat with appropriate antibiotic.

Modified Centor criteria
1. Age between 5 and 15 years
2. Fever
3. Absence of cough
4. Tonsillar exudates
5. Tender anterior cervical lymphadenopathy

Abbreviations: PALS, pediatric advanced life support; RADT, rapid antigen detection test.

For class of evidence definitions, see page 26.
Clinical Pathway For Evaluation Of The Adolescent With Pharyngitis

Assess airway and respiratory status

Is there evidence of airway obstruction?

YES → Perform PALS resuscitation.
Consider specialty consultation if difficult airway is anticipated.
(Class I)

NO → Is there evidence of dehydration?

YES → Order adequate analgesia and peripheral or oral hydration.
(Class I)

NO → Perform history and physical examination.

Are upper respiratory infection symptoms present?

YES → Do not perform RADT or throat culture.
Do not treat with antibiotics.
Perform symptomatic care.
(Class I)

NO → Are 3 or 4 Centor criteria present?

YES → Empiric treatment.
Do not test.
(Class II)

NO → Are 2 Centor criteria present?

YES → Perform RADT
Is RADT positive?

YES → No throat culture and no treatment.
(Class II)

NO → Treat with appropriate antibiotic.
(Class I)

NO → Is 1 Centor criteria present?

YES → Do not test and do not treat.
Consider alternate diagnosis.
(Class II)

NO → Consider alternate diagnosis.

Centor Criteria
1. Fever
2. Lack of cough
3. Tender cervical lymphadenopathy
4. Tonsillar exudates

Abbreviation: RADT, rapid antigen detection test.

For class of evidence definitions, see page 26.
**Trismus**
Trismus, or the inability to open the mouth fully without pain, is commonly seen in patients with peritonsillar abscess. Inflammation of the pterygoid muscle leads to pain and can make complete examination of the pharynx difficult.

**Tonsillar Enlargement And Injection**
Large tonsils can be observed with a variety of conditions that cause pharyngitis, including viral illness, GAS and non-GAS bacterial infections, and allergic rhinitis. The presence of redness or injection of the tonsils is more indicative of an infectious process but is not specific for either a viral or a bacterial cause.

**Tonsillar Exudates**
Exudates can be described as thick or thin and range in color from white to yellow to gray or may even be bloody. Group A streptococcus infection is associated with thick tonsillar exudates. Tonsillar exudates are also commonly seen with infectious mononucleosis and can be significant. Although quite uncommon in the developed world, *C diptheriae* infection classically presents with the formation of a thin, gray pseudomembrane that can cover the pharynx and tonsils and may lead to airway compromise.

**Vesicles And Ulcers**
Ulcerative lesions are commonly seen in coxsackie virus infection. Usually found on the soft palate and posterior pharynx, the lesions start as vesicles that eventually slough, leaving 4-mm to 8-mm ulcers with surrounding rings of erythema. Gingivostomatitis caused by herpes virus also causes vesicle and ulcer formation that typically involves the entire oropharynx as well as the lips and perioral area. In endemic areas, *F tularensis* infection may also lead to an ulcerative pharyngitis.

**Petechiae**
Palatal petechiae are often seen with GAS infections and are occasionally seen in patients with infectious mononucleosis. If purpura is observed in the mouth or if petechiae are found on other areas of the body, it is essential to consider possible hematologic, septic, or oncologic causes.

**Neck**
Cervical lymphadenopathy is a frequent finding in patients with pharyngitis. Tender, anterior cervical lymphadenopathy is commonly seen with GAS infections. Significant enlargement of the cervical lymph nodes can be seen with diphtheria infection, leading to the finding of a “bull neck.” Posterior as well as anterior lymphadenopathy is common with infectious mononucleosis. Unilateral neck swelling or pain suggests a serious infection, such as peritonsillar abscess, cervical adenitis, or a noninfectious process like Kawasaki disease. Patients with a retropharyngeal abscess often complain of neck pain and are unable to fully extend the neck owing to pain. Situations in which sick-looking children present with a high fever, neck pain, and a decreased range of neck motion raise concern about possible meningitis, and these findings may require lumbar puncture for an accurate diagnosis.

**Lungs**
Stridor, caused by upper airway edema in the area of the glottis, is a common finding in patients with croup but may also be associated with more serious conditions such as epiglottitis or foreign-body aspiration. Signs of respiratory distress include an increased respiratory rate and increased work of breathing marked by nasal flaring, use of accessory muscles, suprasternal or intercostal retractions, or grunting. In severe cases, the patient may appear anxious or air hungry, which requires an immediate response to secure the airway. Other lung findings might include rales, wheezing, or rhonchi in cases of pharyngitis associated with viral illness or atypical bacterial infections such as *M pneumoniae* or *C pneumoniae*.

**Abdomen**
Generalized abdominal tenderness on palpation may be evident in GAS pharyngitis. An enlarged and tender spleen can be seen in up to 65% of cases of infectious mononucleosis. Hepatomegaly is less common.

**Lymphadenopathy**
Cervical lymphadenopathy was discussed previously. More widespread lymphadenopathy (eg, axillary or inguinal) can be seen in infectious mononucleosis and HIV infection.

**Skin**
Rashes can be observed with many of the illnesses that cause pharyngitis. Scarlet fever is caused by a GAS subtype that produces an erythrogenic toxin. This leads to the usual features of GAS infection but also the appearance of erythematous, sandpaper-like rash all over the body that is more pronounced in the axillae and groin. It typically spares the circumoral area, leaving an area of apparent pallor. After a few days of illness, the rash begins to peel, particularly on the palms and soles. Infectious mononucleosis sometimes presents with a pink, nondescript maculopapular eruption, but more commonly known is the erythematous whole-body maculopapular eruption that occurs if a patient with infectious mononucleosis is treated with ampicillin or amoxicillin. Coxsackie virus causes an erythematous papular, vesicular, or pustular eruption on the hands, feet, and buttocks in addition to...
A haemolyticum infection often leads to a scarlatiniform rash that does not peel. Non-descriptive rashes have been observed in the acute retroviral syndrome of HIV infection as well as in many other viral illnesses.

**Diagnostic Studies**

Diagnostic testing, if needed at all, is based initially on whether the patient is presumed to have a life-threatening cause of pharyngitis. Diagnostic studies are then chosen based primarily on how stable the patient is and whether he or she can tolerate a change in position or the discomfort associated with the testing. Plain radiographs of the neck can be helpful if one suspects a retropharyngeal abscess, foreign-body aspiration/ingestion, or epiglottitis. A lateral view of the neck in an extended position will show edema of the prevertebral soft tissue or free air in the posterior pharyngeal soft tissue in the case of abscess. To determine whether the swelling is severe, assess the width of the prevertebral soft tissue; if it is greater than one-half the width of the corresponding vertebra, it is considered significant. The lateral neck film may also reveal the presence of a foreign body and whether it is radio-opaque, and it can also demonstrate the presence of an enlarged epiglottis, known as the “thumbprint sign.” A high-kilovolt radiograph will magnify the upper airway and can be useful in identifying supraglottic narrowing or the “steeple sign” seen with epiglottitis. If the lateral neck film suggests a retropharyngeal abscess or if there is concern for other deep neck infections, such as Lemierre syndrome or an abscessed cervical lymph node, computed tomography (CT) of the neck with IV contrast is indicated to determine the exact location of the infection and whether there is true abscess formation, as opposed to cellulitis or phlegmon. These findings drive treatment, whether surgical or medical. Blood tests such as a CBC with differential are useful to determine whether an infection is most likely bacterial or viral, as based on the total white blood cell (WBC) count and the presence of bands. Blood culture, if positive, is useful for directing antibiotic therapy.

For patients with an apparently non-life-threatening cause of pharyngitis, the history and physical examination will determine what, if any, diagnostic testing is needed. The only bacterial cause of pharyngitis that is regularly diagnosed and treated with antibiotics is GAS. As mentioned earlier, the primary rationale for treating GAS pharyngitis is to avoid supplicative complications, such as peritonsillar abscess, retropharyngeal abscess, otitis media, and sinusitis, as well as nonsuppurative complications such as acute rheumatic fever or poststreptococcal glomerulonephritis. A recent Cochrane review of the use of antibiotics to treat sore throat found good evidence to support both rationales. The same review found that treatment of GAS pharyngitis with antibiotics also decreased the duration of the illness by about 24 hours. Decreased infectivity toward others is yet another reason to treat GAS pharyngitis, since the organism is not usually present on throat culture about 24 hours after starting treatment—meaning that the patient can return to school or work sooner. The diagnostic studies most commonly used in the ED setting are RADTs and throat culture on a BAP. In the pediatric setting, the most convenient way to obtain the sample is with a two-headed swab vigorously rubbed over the tonsils and posterior pharynx. Since it is crucial to avoid sampling the tongue and buccal mucosa, it is best to request that the parents, even those of school-aged children, hold the child securely against them, facing the practitioner, so that the sample can be obtained in a quick and efficacious manner.

**Rapid Antigen Detection Testing**

Rapid antigen detection testing was introduced in the 1980s to address the delays in diagnosis with traditional throat culture, the results of which are typically not available until 24 to 48 hours after collection. The tests utilize specific antibodies to identify GAS cell-wall carbohydrate antigen. The throat swab is treated with an acid solution that helps to extract the antigen from the cell wall. The RADTs in widespread use today are based on optical immunoassay technology, and results are typically available within minutes of collection. Despite RADT’s potential to diagnosis GAS in a more timely manner than a throat culture, it has been shown in many clinical studies that its sensitivity (typically 70%-90%) is unacceptably low to be relied on alone for diagnosis, so a back-up throat culture is recommended for children with a negative result on RADT; however, the exception to this practice would be in cases where the results of the specific RADT in use have been compared directly with those of the blood agar plate cultures and have confirmed an adequate degree of sensitivity to forgo a back-up throat culture. Nevertheless, the sensitivity of RADT can change depending on the severity of illness. There is a well-documented spectrum bias that has shown an increased sensitivity of RADT with the increased severity of illness. In one study the sensitivity of RADT ranged from 59% to 83% based on pretest likelihood of GAS infection; however, even with the highest pretest probability, the negative predictive value was still less than 95%, leading the authors to recommend back-up throat cultures if RADT is negative. The specificity of RADT has been found to be quite high (90%-99%), however, meaning that a positive result on RADT is likely to indicate a GAS infection, which can be treated without a back-up throat culture.
antigen detection testing is particularly useful in the ED setting where the potential lack of follow-up makes use of throat culture alone less attractive. Several studies have found that the use of RADT reduces the need to prescribe antibiotics in patients found to have non-GAS causes of pharyngitis, thus decreasing the risk that non-GAS bacteria will develop antibiotic resistance.75,76

**Throat Culture**

Throat culture on a BAP is the standard by which GAS pharyngitis is diagnosed. However, since there is no standard protocol for performing a BAP culture, it has been difficult to compare it directly with RADT. Many factors have been shown to affect the sensitivity of BAP, including the type of medium, duration of incubation, atmosphere of incubation, swab techniques, and the setting (office or laboratory). In a recent study comparing the use of optical immunoassay RADT to office BAP and diagnostic laboratory BAP, the office BAP was found to be significantly more sensitive (81%) than the RADT (70%), but neither test was as good as a laboratory BAP. A combined RADT and back-up office BAP throat culture had higher sensitivity than either test alone (85%) but was still lower than that for the laboratory BAP culture.77 The ED setting typically has the benefit of diagnostic laboratory support and access to the “gold standard” BAP; however, it is vitally important for the clinician to obtain an adequate sample, as described previously. It is also crucial to ensure that accurate call-back information for the patient is available if RADT is negative but the throat culture is positive.

Neither RADT nor BAP can distinguish active GAS infection from asymptomatic carriage of the organism in the nasopharynx. In a recent meta-analysis, 12% of children over 5 years of age were found to be GAS carriers.9 Many patients with simultaneously collected negative RADT and positive BAP culture are found to have only small numbers of GAS colonies. Some investigators have suggested that, in such cases, the positive throat culture is due to carriage of streptococcus; however, studies have demonstrated that a large proportion of patients with false-negative results on RADT were actually infected with GAS and were not just carriers.78 Generally speaking, carriers do not need to be identified or treated with antibiotics, since they are at very low risk for rheumatic fever and are not thought to be important in the spread of GAS to their contacts.79 Group A streptococcus carriage can persist for several months after infection and can confuse the diagnosis in new cases of pharyngitis. The current AHA/AAP guideline recommends treating all patients with signs and symptoms of pharyngitis who have a positive result on RADT or BAP culture. Eradication of GAS carriage is sometimes desirable, as discussed in this issue.3

**Streptococcal Antibody Tests**

The most commonly used tests to detect streptococcal infection are antistreptolysin-O (ASO) and antideoxyribonuclease B (anti-DNase B). These tests are not used regularly but can be useful while working up patients with possible nonsuppurative complications of GAS infection, such as acute rheumatic fever or glomerulonephritis. A rising or elevated antibody titer is useful in diagnosing a past GAS infection, as antibodies can remain elevated for months.3

**Heterophile Antibody Test**

Commonly known as a “monospot test,” the heterophile antibody is used to test for infectious mononucleosis. Infection with Epstein-Barr virus induces a heterogeneous group of mostly immunoglobulin M-type (IgM-type) antibodies to interact with an antigen on the surface of infected cells. The monospot test uses epitopes for the cell-surface antigen from nonhuman sources (ie, sheep, horse, guinea pig) that cross-react with the patient’s heterophile antibodies and lead to red blood cell agglutination.84 Antibody levels peak during the first 2 weeks of illness. The heterophile antibody test is quite sensitive (85%) and specific (97%) in adolescents and adults, but it is positive in only 25% to 75% of children under 4 years of age.85 In such cases it is useful to obtain specific serologies for the Epstein-Barr virus (antivasoconstrictor assay, IgM, and immunoglobulin G) to make the diagnosis, the caveat being that most hospital laboratories do not perform these tests on an emergent basis, so results would not be available prior to discharging or admitting the patient.

**Complete Blood Count With Differential**

A CBC is not useful for diagnosing most causes of pharyngitis. However, infectious mononucleosis has classic findings that, if present, are very helpful in making the diagnosis. Marked lymphocytosis (> 50%) with at least 10% atypical lymphocytes is highly suggestive of infectious mononucleosis. If the total WBC count is significantly elevated, particularly with a left shift, more serious bacterial infections, such as retropharyngeal abscess or Lemierre syndrome, are more likely, particularly if the patient appears ill.

**Clinical Scoring Systems**

It has been recognized for decades that it is difficult for even experienced practitioners to differentiate GAS pharyngitis from other (usually viral) causes of sore throat on clinical grounds alone. Clinical scoring systems have been developed to address this issue in hopes of avoiding the sequelae of untreated GAS infection while also avoiding unnecessary antibiotic use. In 1977, Breese introduced a pediatric score card based on the finding of fever, headache, cervical adenopathy, erythema, swelling, or exudate
from the pharynx or tonsils; the absence of upper respiratory symptoms (eg, cough, rhinorrhea, or conjunctivitis); epidemiologic factors, including age between 5 and 15 years and time of year (November to May); and laboratory results (an elevated WBC count). In 1998, Wald et al simplified the Breese score card to avoid the discomfort of drawing blood by eliminating the WBC count. A score of 6 (all criteria met) had a positive predictive value of 75%; however, 23% of patients with a score of only 2 or 3 also had positive throat cultures, leaving a significant number of children with a GAS infection potentially untested and untreated. They concluded that the score card could not replace the use of diagnostic testing for GAS pharyngitis but was potentially useful for targeting patients in whom the RADT was most likely to be positive.

The Centor scoring system, first described in 1981 by Centor et al, remains one of the standards in the diagnosis of GAS pharyngitis in adolescents (over age 15 years) and adults. It is currently cited in the CDC/AAFP/ACP/ASIM guideline. The scoring system is easy to use, having only 4 equally weighted criteria: the presence of tonsillar exudates; swollen, tender anterior cervical lymph nodes; lack of a cough; and a history of fever. Mclsaac et al developed a modified Centor score that has been validated in children and adults. The criteria measured are the same as Centor’s with points added or subtracted according to the patient’s age. Use of the score card to manage patients in several family practice locations in Canada was found to potentially decrease unnecessary antibiotic use by 63.7%.

It is widely accepted that patients (pediatric and adult) with a score of 0 or 1 require neither testing nor treatment. Otherwise, various advisory committees disagree on how to manage patients with higher scores. The Infectious Diseases Society of America recommends RADT or RADT plus throat culture for patients with a score of 3 or higher before antibiotic therapy is begun. The CDC/AAFP/ACP/ASIM guideline states that patients with a score of 3 or 4 may be started empirically on antibiotics. This practice has been found to be associated with a high rate of unnecessary antibiotic use but has also been defended as an effective way to relieve suffering and expedite return to work. Limitations in clinical scoring systems include interobserver disagreement regarding physical examination findings and tendency of physicians to not follow any guidelines. One study found that up to 81% of pediatricians and family practitioners used an inappropriate strategy for dealing with viral pharyngitis. Another study showed that 78% of primary care providers in a local healthcare system did not adhere to any guideline.

**Cost-Effectiveness Of RADT And Throat Culture In Diagnosing GAS Pharyngitis**

Cost-effectiveness analysis and decision analysis have been used to evaluate various diagnostic and treatment strategies for GAS pharyngitis. However, it is difficult to compare results between analyses as there is little consistency between them. Most of the recently published analyses do not report cost-effectiveness from the same perspective or have the same outcome measurements. One study measured cost-effectiveness in terms of preventing one case of rheumatic heart disease, whereas others measured dollars spent per complication (suppurative and nonsuppurative) and cases of severe antibiotic reactions prevented. Another very recently published cost-effectiveness analysis considered only the insurance payer’s perspective, while others have studied cost-effectiveness from a societal perspective. Different rates of sensitivity of RADT and BAP culture are assumed, as are different incidence rates of suppurative and nonsuppurative complications of GAS infections. These inconsistencies lead authors to different conclusions, leaving clinicians without a clearly defined evidence-based strategy. However, the one conclusion that is consistent across all analyses is that although treating all cases of pharyngitis empirically, without any confirmatory testing, is the most effective for avoiding the complications of GAS pharyngitis, this approach results in an unacceptably high rate of unnecessary antibiotic use as well as high morbidity due to severe allergic reactions.

**Special Circumstances**

Clinical scoring systems were developed to determine which patients are most likely to have GAS pharyngitis and are quite useful in everyday practice; several studies have shown that patients with high Centor or modified Centor scores (4 or 5 points) are most likely to have a positive result on RADT. Those with scores of 2 points or less are often not tested. The exception to these recommendations is during an outbreak of rheumatic fever. Although acute rheumatic fever is exceedingly rare in the United States, with an incidence of approximately 1 per 100,000, sporadic outbreaks have been reported since the 1980s in western Pennsylvania, Denver, and Salt Lake City. In the unusual circumstance of a local outbreak of rheumatic fever, efforts must be made to identify all possible cases of GAS pharyngitis and may require that physicians at least obtain throat cultures, even for patients with low clinical scores.

**Controversies And Cutting Edge**

The clinical scoring systems currently in use in the United States, Canada, and other developed
1. “The patient had swollen, red tonsils with a lot of thick exudates. The RADT was negative, but with the clinical examination I was sure he had GAS, so I prescribed amoxicillin pending the throat culture results. He came back 2 days later with a terrible rash and the throat culture was negative. What’s going on?”

The signs and symptoms of GAS pharyngitis are nonspecific, and it can be difficult to differentiate between GAS and other causes of pharyngitis. Infectious mononucleosis, a well-known cause of exudative pharyngitis, is often accompanied by a high fever and swollen cervical lymph nodes. Almost all cases of GAS pharyngitis will resolve within 5 days, even if not treated. Keep this in mind when evaluating a child with pharyngitis of prolonged duration, and broaden the differential diagnosis to include other possibilities besides GAS. An erythematous maculopapular rash often develops in patients with infectious mononucleosis who are treated with ampicillin-like antibiotics, such as amoxicillin. The mechanism of this reaction is not known. Although the rash is not an allergic rash and is not dangerous, it is still unsightly and often upsets caregivers.

4. “I thought the patient had croup but wanted to get a good look at her throat in case she had a foreign body back there. She started crying hard then stopped breathing. She was a tough intubation and ended up in the ICU. I didn’t think kids got epiglottitis anymore.”

Children with signs of upper airway obstruction should be approached carefully and allowed to maintain a position of comfort. Agitating the child may lead to crying and possibly complete airway obstruction. Do not examine the ears or mouth or try to reposition the child unless absolutely necessary. In the age of widespread vaccination against HIB, epiglottitis is seen much less commonly in children than in the past but is still a concern in unimmunized or under-immunized children. It is necessary to maintain a high index of suspicion for this rare but potentially deadly infection.

2. “That kid was tough to examine! I think I swabbed her tonsils before she bit down on the culture swab.”

Obtaining a throat swab specimen from a pediatric patient can be very challenging, but it is imperative to do so for the RADT and throat cultures to provide the emergency clinician with the most accurate information possible. The tonsils and posterior pharynx need to be swabbed vigorously, and the culturette may not touch the tongue, teeth, or buccal mucosa. Use of a tongue blade is essential. Caregivers should be asked to hold the child firmly against them, facing the practitioner. One arm wraps around the child’s arms and chest while the other hand holds the forehead firmly against the caregiver’s chest. This is the fastest and most efficient way to obtain the swab and avoids having to repeat the procedure in an already anxious patient.

5. “I’ll never miss a case of strep throat because I treat every patient who has a red throat with antibiotics.”

More than one cost-effectiveness and decision analysis regarding the diagnosis and treatment of GAS pharyngitis has come to the conclusion that a “treat all” strategy is most effective for avoiding the complications of GAS pharyngitis. However, none of the study authors could recommend this strategy owing to the large number of severe allergic reactions that may occur. In an age of increasing antibiotic resistance, prescribing so many unnecessary antibiotics is also irresponsible. During an epidemic of acute rheumatic fever, this approach may be re-examined, but in everyday practice it is not appropriate.
6. “I saw that girl 2 weeks ago and diagnosed strep based on a positive rapid test. She’s back again with a sore throat and fever, and her rapid test was positive again. I thought amoxicillin would be more than enough to treat strep.”

Group A streptococcus infection treatment failures may be due to a number of factors, including nonadherence to the prescribed regimen and resistance to the medication prescribed. The patient who presents with symptoms of acute pharyngitis soon after completing treatment for GAS pharyngitis may have been reinfected or may be a carrier of GAS and now has a new viral illness to account for the symptoms. It is recommended that in cases like this, if the RADT is positive and the child has physical findings consistent with GAS infection, another course of an appropriate antibiotic be prescribed.

7. “Teenage girls are impossible! This is her third trip to the ED in 10 days for a sore throat. The rapid test and throat culture are always negative though.”

Adolescents present a particular challenge in emergency medicine. In cases such as this, a broader differential diagnosis is clearly required. Obtaining a detailed social history, including sexual history, is imperative, since less frequent causes of pharyngitis such as *N gonorrhoeae* cannot be cultured on the usual BAP. The acute retroviral syndrome associated with primary HIV infection may present as a mononucleosis-like illness.

8. “There was a history of rash with penicillin documented on the chart, so when the rapid strep came back positive, I sent the patient out on erythromycin, but now he’s back and not feeling better. I thought that erythromycin was the first choice for penicillin-allergic patients with strep throat?”

Erythromycin is the first choice for penicillin-allergic patients with GAS per the Infectious Diseases Society of America and the CDC/AAFP/ACP/ASIM guidelines. However, there have been well-documented cases of erythromycin-resistant GAS. The current AHA/AAP guideline no longer recommends erythromycin because of the greater incidence of gastrointestinal side effects and inconvenient frequency of dosing (4 times a day). Azithromycin is the current macrolide of choice, and first-generation cephalosporins can be used for patients without type I hypersensitivity reactions to penicillins.

9. “That 16-year-old boy looked sick and had a bad sore throat, but his rapid strep test and monospot were negative, so after I hydrated him, I discharged him with a viral illness. I heard he came back a few days later and is in the ICU with Lemierre syndrome. I remember reading about that once in a journal but thought it was very rare.”

*F necrophorum*, the most common cause of Lemierre syndrome, is recognized as a fairly common cause of pharyngitis in adolescents and young adults, accounting for approximately 10% of cases in recent studies. There was increased reporting of Lemierre syndrome between 2001 and 2008, according to a recent systematic review. It is unclear whether this increase is due to differences in antibiotic prescribing patterns and rising antibiotic resistance. It is important to maintain a high index of suspicion when presented with an ill-appearing patient with sore throat.

10. “I thought I did everything right — diagnosed strep throat, prescribed an appropriate antibiotic — but the patient’s parents complained to Customer Satisfaction that I didn’t care enough about their child’s pain.”

No matter the cause of pharyngitis, pain is usually a prominent symptom. Reducing pain not only makes the patient (and their caregivers) more comfortable, it also helps avoid other complications, such as dehydration. Beyond acetaminophen and ibuprofen, it may sometimes be necessary to prescribe stronger analgesics, such as acetaminophen with codeine.
Penicillin V is the preferred first-line treatment for GAS pharyngitis in patients who are not allergic to penicillin. Penicillin V is a narrow-spectrum antibiotic that has never had proven GAS resistance. It is inexpensive and conveniently dosed twice a day. The primary drawback of penicillin is its unpalatability in liquid form. For this reason, amoxicillin suspension is more commonly used for pediatric patients. It has only a slightly broader spectrum of activity and is also reasonably priced. Newer antimicrobial agents with broad-spectrum coverage should be avoided, such as the third-generation cephalosporins, since they lead to increased rates of antibiotic resistance.

**Risk management caveat:** First-generation cephalosporins and azithromycin are the first-choice antibiotics for patients who are allergic to penicillin.

3. **Back-up throat cultures are generally not necessary in older adolescents if RADT is negative.** The incidence of rheumatic fever is even lower in adolescents (age > 15 years) than it is in children in endemic areas. Therefore, the risk of complications when a case of GAS pharyngitis is missed is much lower than it would be in a school-aged child. This recommendation is endorsed by the Infectious Diseases Society of America as well as the CDC/AAFP/ACP/ASIM guidelines and has been shown to be cost-effective in several decision-making analyses.

**Risk management caveat:** Adolescents and young adults are more commonly infected with other bacteria causing pharyngitis, including non–group A streptococci, *F necrophorum*, *N gonorrhoeae*, and *A haemolyticum*. Emergency clinicians should keep these organisms in mind, particularly when a patient has symptoms that persist beyond the usual duration or has historical or physical findings suspicious for these other, less common infections.
whether it is more important to treat patients who present with a serious sore throat and attempt to relieve their symptoms or to avoid the greater societal risk of antibiotic resistance.85

**Disposition**

Criteria for discharge home from the ED include the ability to tolerate oral fluids, adequately controlled pain, and the presence of an open and patent airway. No matter the cause of pharyngitis, patients and parents must be instructed to strongly encourage the increased intake of fluids and to treat fever and pain as needed with acetaminophen or ibuprofen and other comfort measures appropriate to the patient’s age. Antibiotics, if needed, should be taken exactly as prescribed. Provide the patient and parents with an approximate timeline within which they should observe improvement, and carefully review criteria that should prompt them to return to the ED, including any signs of airway obstruction, drooling, signs of dehydration, and the appearance of new symptoms. It is also imperative to have accurate contact information for the patient’s family if the RADT result was negative and a back-up throat culture was ordered.

**Summary**

Pharyngitis is one of the most common complaints seen in the ED. The principal goal of the emergency clinician is to differentiate between life-threatening and non-life-threatening causes of pharyngitis by maintaining a high index of suspicion and performing a thorough history and physical examination. If deemed necessary, a thoughtful selection of tests based on these findings will provide additional evidence that leads to the correct diagnosis and guides treatment. The judicious use of antibiotics to treat GAS pharyngitis will prevent potentially serious sequelae and prevent the development of antibiotic resistance.

**Case Conclusion**

After 90 minutes, you returned to the room to discuss the results of the laboratory studies. CBC with differential revealed a normal WBC count of 10,000, with 54% lymphocytes and 12% atypical lymphocytes. The heterophile antibody test was positive. You explained to the mother that the patient appeared to have infectious mononucleosis caused by the Epstein-Barr virus. The mother asked what kind of medicine you planned to prescribe to fix him. You told her that the illness would have to run its course but that with adequate hydration and pain management her son should be feeling better within a week. Since he continued to be in no respiratory distress, you decided to withhold steroids. While the laboratory results were pending, the patient was given ibuprofen and became afebrile. He was discharged home with instructions for his parents to follow up with his pediatrician in the next 2 to 3 days to recheck his throat and abdomen and to return to the ED if he has any difficulty breathing or swallowing.

**References**

Evidence-based medicine requires a critical appraisal of the literature based upon study methodology and number of subjects. Not all references are equally robust. The findings of a large, prospective, randomized, and blinded trial should carry more weight than a case report. To help the reader judge the strength of each reference, pertinent information about the study, such as the type of study and the number of patients in the study, will be included in bold type following the reference, where available. In addition, the most informative references cited in this paper, as determined by the authors, will be noted by an asterisk (*) next to the number of the reference.


1. Which of the following recommendations is common to all pharyngitis treatment guidelines examined in this article?
   a. RADT or treatment should not be carried out for patients with symptoms suggestive of viral illness.
   b. RADT or throat culture should be performed for patients presenting with symptoms suggestive of GAS infection.
   c. Utilize a scoring system to determine when a patient needs RADT or presumptive treatment for GAS infection.
   d. None of the above

2. Which of the following statements is NOT true?
   a. Most cases of pharyngitis are spread via respiratory droplets and aerosol dispersion.
   b. School-aged children between the ages of 5 and 15 are the most often affected by pharyngitis.
   c. The vast majority of pharyngitis cases are caused by bacteria.
   d. GAS is the most common organism causing bacterial pharyngitis.

3. Classic symptoms of epiglottitis include:
   a. Sore throat
   b. Fever
   c. Muffled voice
   d. All of the above

4. Pharyngoconjunctival fever is a clinically distinct syndrome caused by a specific serotype of adenovirus that is characterized by:
   a. High fever (> 39°C [102.2°F])
   b. Pharyngitis with or without tonsillar exudates
   c. Nonpurulent conjunctivitis, rhinitis, and preauricular and cervical adenopathy
   d. All of the above

5. Plain radiographs of the neck can be helpful if which of the following are suspected?
   a. Retropharyngeal abscess
   b. Foreign-body aspiration
   c. Both A & B
   d. None of the above

6. GAS is the only bacterial cause of pharyngitis that is not regularly treated with antibiotics.
   a. True
   b. False
7. Which of the following is NOT true regarding the use of penicillin in the treatment of children with GAS?
   a. The taste of penicillin can make it difficult to administer to children.
   b. Amoxicillin has been shown to be less palatable that penicillin and is not an acceptable substitute.
   c. Amoxicillin given once per day has been shown to be as effective as penicillin V given twice per day.
   d. None of the above

8. There are no specific recommendations for empirically treating children for GAS without first performing RADT or obtaining a BAP throat culture.
   a. True
   b. False

9. Adolescents and young adults present a particular challenge in the diagnosis and treatment of pharyngitis because:
   a. Young adults are more susceptible to GAS than younger children.
   b. Young adults have a higher morbidity caused by non-GAS streptococcal and anaerobic bacterial infections.
   c. Both A & B
   d. None of the above

10. Criteria for discharge home after treatment of pharyngitis includes:
    a. Ability to tolerate fluids
    b. Adequately controlled pain
    c. Open and patent airway
    d. All of the above

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**Class Of Evidence Definitions**

Each action in the clinical pathways section of *Pediatric Emergency Medicine Practice* receives a score based on the following definitions.

<table>
<thead>
<tr>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
<th>Indeterminate</th>
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<tbody>
<tr>
<td>• Always acceptable, safe</td>
<td>• Safe, acceptable</td>
<td>• May be acceptable</td>
<td>• Continuing area of research</td>
</tr>
<tr>
<td>• Definitively useful</td>
<td>• Probably useful</td>
<td>• Possibly useful</td>
<td>• No recommendations until further research</td>
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<td>• Proven in both efficacy and effectiveness</td>
<td>• Level of Evidence:</td>
<td>• Considered optional or alternative treatments</td>
<td>• Evidence not available</td>
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<td>Level of Evidence:</td>
<td>• Generally higher levels of evidence</td>
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<td>• Higher studies in progress</td>
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<td>• 1 or more large prospective studies are present (with rare exceptions)</td>
<td>• Non-randomized or retrospectively studies: historic, cohort, or case control studies</td>
<td>• Results inconsistent, contradictory</td>
<td>• Results not compelling</td>
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<td>• High-quality meta-analyses</td>
<td>• Less robust RCTs</td>
<td>• Occasionally positive results</td>
<td>Significantly modified from: The Emergency Cardiovascular Care Committees of the American Heart Association and representatives from the resuscitation councils of ILCOR: How to Develop Evidence-Based Guidelines for Emergency Cardiac Care: Quality of Evidence and Classes of Recommendations; also: Anonymous. Guidelines for cardiopulmonary resuscitation and emergency cardiac care. <em>Emergency Cardiac Care Committee and Subcommittees, American Heart Association</em>. Part IX. Ensuring effectiveness of community-wide emergency cardiac care. <em>JAMA</em>. 1992;268(16):2289-2295.</td>
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Table of Contents

- Introduction
- Patient, Client, or Customer?
- How Do Physicians Respond To Customer Service Feedback?
- Reasons To Enhance Overall Patient Satisfaction
  - Patient Satisfaction And Effective Clinical Care
  - Patient Satisfaction And Litigation Risk
  - Patient Satisfaction And Staff Satisfaction
  - Patient Satisfaction And Fiscal Success
- Fostering Patient-Centered Care In Medical Trainees
- Patient Satisfaction In Pediatric Emergency Medicine

Sources Of Input

- Unsolicited Patient Feedback
- Solicited Patient Feedback
  - Telephone Surveys
  - Mailed Surveys
  - Other Tools
    - Customer Service Liaisons
    - Patient Rounds By ED Leadership Team
    - In-house Suggestion Card
    - Customer Feedback Page
    - Staff Reminders
    - Discharge Callback Process

Factors That Correlate With Patient Satisfaction

- Length Of Stay (LOS)
- Effective Communication
- Demographic Variables
  - Daily And Seasonal Variations
  - Acuity
  - Pain Management
  - Physician Gender
  - Physicians In Training

Authors

Naghma S. Khan, MD
Division Director, Pediatric Emergency Medicine, Emory University School of Medicine, Children’s Healthcare of Atlanta, Atlanta, GA

Melissa S. Madden, MD
Guest Services Coordinator, Emergency Services, Children’s Healthcare of Atlanta, Atlanta, GA

John S. Misdary, MD
Fellow, Pediatric Emergency Medicine, Emory University School of Medicine, Atlanta, GA

Peer Reviewers

Alson Inaba, MD, FAAP, PALS-NF
Pediatric Emergency Medicine Attending Physician, Kapioi ani Medical Center for Women & Children; Associate Professor of Pediatrics, University of Hawaii
John A. Burns School of Medicine, Honolulu, HI; Pediatric Advanced Life Support National Faculty Representative, American Heart Association, Hawaii and Pacific Island Region

Mike Witt, MD, MPH, FACEP, FAAP
Medical Director, Pediatric Emergency Medicine, Elliot Hospital, Manchester, NH

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